What Is Claimed Is:

1. A microfabricated diamond element wherein at least one columnar body of a quadrangular cross section comprising diamond is formed on a substrate, and

wherein lengths of a long side and a short side in the cross section of the columnar body satisfy relational expressions represented by Formulae (1) and (2) below;

$$C_1 = 2a\sqrt{1+k^2} \cdots (1)$$
$$n\lambda \approx C_1 \cdots (2)$$

C_1: a distance [nm] of a lap in a situation where l ight generated inside the columnar body goes around on a specific circuit while being reflected on side faces of the columnar body,

n: an arbitrary positive integer,

λ: an emission peak wavelength [nm] of the diamond,

a: the length of the long side [nm], and

k: a ratio of the length of the short side to the length of the long side.

2. A microfabricated diamond element wherein at least one columnar body of a substantially regularly hexagonal cross section comprising diamond is formed on a substrate, and

wherein lengths of sides in the cross section of

the columnar body satisfy relational expressions represented by Formulae (3) and (4) below;

$$C_2 = 3\sqrt{3}b \cdots (3)$$
$$n\lambda \approx C_2 \cdots (4)$$

C_2: a distance [nm] of a lap in a situation where l ight generated inside the columnar body goes around on a specific circuit while being reflected on side faces of the columnar body,

n: an arbitrary positive integer,

λ: an emission peak wavelength [nm] of the diamond, and

b: the length of the sides [nm].

3. A microfabricated diamond element wherein at least one columnar body of a circular cross section comprising diamond is formed on a substrate, and

wherein when a length of a radius in the cross section of the columnar body is r [nm], and a specific circuit, on which light generated inside the columnar body goes around while being reflected on a side face of the columnar body, is represented by a regular polygon in which a distance from a center to corners thereof is r [nm], the perimeter C_3 [nm] of the regular polygon satisfies relational expressions represented by Formulae (5) and (6) below:

$$3\sqrt{3}r < C_3 < 2\pi r \cdots (5)$$
$$n\lambda \approx C_3 \cdots (6)$$

n: an arbitrary positive integer, and

λ: an emission peak wavelength [nm] of the diamond.

4. The microfabricated diamond element according to Claim 1, wherein each side face of the columnar body is a flat surface consisting of a diamond crystal face.

5. The microfabricated diamond element according to Claim 4, wherein the diamond crystal face is a (100) face.

6. The microfabricated diamond element according to Claim 1, wherein a width w_1 of the columnar body is expressed by Formula (7) below;

$$w_1 = a\sqrt{1+k^2} \cdots (7)$$

, and

wherein the width w_1 is not more than 500 nm.

7. The microfabricated diamond element according to Claim 2, wherein a width w_2 of the columnar body is expressed by Formula (8) below;

$$w_2 = 2b \cdots (8)$$

, and

wherein the width w_2 is not more than 500 nm.

8. The microfabricated diamond element according to Claim 3, wherein a diameter of the columnar body is not more than 500 nm.

9. The microfabricated diamond element

according to Claim 1, wherein a width w_1 of the columnar body is expressed by Formula (7) below;

$$w_1 = a\sqrt{1+k^2} \cdots (7)$$

, and

wherein a ratio of a height to the width w_1 of the columnar body is not less than 2.

10. The microfabricated diamond element according to Claim 2, wherein a width w_2 of the columnar body is expressed by Formula (8) below;

$$w_2 = 2b \cdots (8)$$

, and

wherein a ratio of a height to the width w_2 of the columnar body is not less than 2.

11. The microfabricated diamond element according to Claim 3, wherein a ratio of a height of the columnar body to a diameter of the columnar body is not less than 2.

12. The microfabricated diamond element according to Claim 1, wherein a ratio of a sectional area of the cross section normal to the longitudinal direction of the columnar body to an overall exposed area of the columnar body is not more than 1/10.

13. The microfabricated diamond element according to Claim 1, wherein the columnar bodies are arranged at equal intervals.

14. The microfabricated diamond element

according to Claim 1, wherein an optically transparent film with a refractive index smaller than that of the diamond is formed in part of the side face of the columnar body.

15. A method of fabricating a microfabricated diamond element, comprising:

an etching step of placing a metal in contiguity with a diamond substrate in a reaction chamber and then effecting reactive ion etching on the diamond substrate in the reaction chamber.

16. The method according to Claim 15, wherein the etching step comprises a step of introducing a CF_4/O_2 gas at a flow ratio of CF_4 not more than 3% as a reactive gas into the reaction chamber.

17. A method of fabricating a microfabricated diamond element, comprising:

a step of patterning a diamond substrate with microscopic Al dots not more than 500 nm in diameter in an arrayed state; and

a step of effecting reactive ion etching on the diamond substrate in a reaction chamber into which a CF_4/O_2 gas is introduced at a flow ratio of CF_4 not more than 3%.

18. The method according to Claim 15, further comprising:

a diamond crystal face forming step of exposing

the diamond substrate with microscopic projections formed by the etching step, to a plasma of a gas mainly comprised of hydrogen.

19. A microfabricated diamond element wherein at least one columnar body of a quadrangular cross section comprising diamond and having a maximum diameter of not more than 50 nm is formed on a substrate, and

wherein lengths of a long side and a short side in the cross section of the columnar body satisfy relational expressions represented by Formulae (9) and (10) below;

$$n\gamma \approx 2a \cdots (9)$$
$$m\gamma \approx 2ka \cdots (10)$$

n: an arbitrary positive integer,

m: an arbitrary positive integer,

γ: the de Broglie wavelength [nm] of electrons or holes in the diamond,

a: the length of the long side [nm], and

k: a ratio of the length of the short side to the length of the long side.